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Editorial

African Archaeozoology Today: Multi-Analytical Approaches to Human-Animal Interactions in the African Past
Quaternary International Special Volume in African Archaeozoology

1. Introduction

This volume of *Quaternary International* is comprised primarily of papers presented at the 23rd biennial meeting of the Society of Africanist Archaeologists (SAfA), which was held at the Université Jean Jaurès in Toulouse, France, from June 26-July 2, 2016. The large number and diverse scope of the faunal papers presented at the SAfA conference offered an excellent opportunity to highlight innovative African archaeozoological research of broad anthropological relevance beyond Africanist contexts. In global debates on human history and human-environment and human-animal interactions, African examples dating to the Holocene are underrepresented (see also Jousse and Lesur, 2011). Yet, as this volume will demonstrate, archaeozoological research in Africa is generating valuable data and insights that have the potential to drive the formulation of new questions and approaches in anthropological archaeology in other regions. The seventeen contributions to this volume integrate a diverse range of approaches in analyzing archaeozoological material, and offer richly sourced understandings of human-animal interactions in Africa, which not only help us better understand the African past, but also lend insight into future human-environmental dynamics on the continent.

The study of animal remains from archaeological sites, known as archaeozoology or zooarchaeology, is a well-established field within archaeology (see Steele, 2015; Albarella, 2017 for overview). In the African context, archaeozoology has a long and distinguished history (Gifford-Gonzalez, 1999; Marshall and Mutundu, 1999; see also Antonites et al., 2016). The rich mosaic of hunting, fishing, foraging, pastoralist, agriculturalist and agro-pastoralist adaptations of communities seen across the continent, coupled with incredible animal diversity, create many opportunities to study diverse coupled human-animal systems across a large span of time. Indeed, the African continent's long archaeological record offers the opportunity to study the very earliest evidence for human-animal interactions from Pleistocene deposits in southern and eastern Africa, how these early interactions have contributed to the evolution of modern humans, and how they have subsequently evolved through dramatic shifts in climate and environment and through major cultural and political developments of the Holocene.

At the same time, peoples of the African continent have followed unique trajectories in their interactions with diverse environments that push us to re-think established ideas about sequences of social, technological and political development. For example, the development of pastoralism in Early and Middle Holocene Africa appears to precede that of agriculture, a pattern not seen in other centers of early food production (Marshall and Hildebrand, 2002). Given this variegated and deep-time record of human-animal interactions, we set out to reiterate what others have said about the global relevance of African archaeozoology (see for example contributions on African archaeozoology in Albarella et al., 2017), while highlighting the most recent wave of innovative and integrative research being carried out across the continent.

The special volume is divided into three sections, which broadly reflect the archaeozoological themes presented at the SAfA conference, namely general African archaeozoology, multi-analytical approaches to African archaeozoology and African fishers, the latter of which remain underrepresented within African archaeozoology and warrant a special review in this introduction to the special volume. Research presented in this volume spans a substantial range of geographic and culture areas. Faunal assemblages from northern (Algeria, Egypt, Morocco, Sudan and Tunisia), and eastern Africa (Djibouti, Ethiopia, Kenya, Madagascar, Somalia and Tanzania) are particularly well-represented, in addition to ones from western (Mali) and southern Africa (South Africa). The following two sections provide a summary of the diverse papers grouped in the "general archaeozoology" and "multi-analytical approaches" sections, highlighting their relevance to the field. The final section of the introduction provides a brief review of the state of our knowledge on the contribution of fishers to ancient African economies, referring in particular to papers in this volume.

2. General themes in African archaeozoology

The first section includes seven articles related to general archaeozoological themes that use conventional archaeozoological methods. Most of these papers were presented as part of general or other thematic sessions at the SAfA conference. In terms of methodology, insights from taphonomic analysis – used as an aid to understand site formation processes and site utilization, as well as sample integrity – feature prominently in this section (Faulkner et al., 2018; Nel et al., 2018; Lesur et al., 2018; Stoetzel et al., 2018; Yeshurun, 2018). From a thematic point of view, subsistence (Faulkner et al., 2018; Jones et al., 2018; Lesur et al., 2018; Yeshurun, 2018) and environmental reconstructions (Nel et al., 2018; Jones et al., 2018; Stoetzel et al., 2018; Yeshurun,

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2018) are well represented.

Nel et al. (2018), for the southern African Cape coast (c. 120 – 85 ka BP), and Stoetzel et al. (2018), for southeastern Ethiopia (c. 43 – 4 ka BP), use small mammal remains to characterize the paleo-environmental context within which humans subsisted. Yeshurun (2018) and Jones et al. (2018), on the other hand, investigate human adaptations to changing environmental and climatic conditions in the Nile Valley (c. 22.5 – 14.5 ka BP) and southern Somalia (c. 20 – 5 ka BP), respectively.

Faulkner and colleagues (2018) tease out the complexities of first millennium CE mollusc exploitation in Zanzibar and question the long-held perception that they are mere secondary food sources. Instead, their work shows that, in this particular context, molluscan resources are key economic components that serve to buffer populations against economic risk.

The focus then turns to domesticated animals, with Lesur and colleagues (2018) identifying a leather production locale through an ethnographic interpretive lens. In this paper, the authors demonstrate that the interpretation of atypical archaeozoological data can benefit from the use of ethnographic and historical sources. Interested in the development and antiquity of southern Ethiopia's caste system, Lesur et al.'s investigations reveal evidence for specialized leatherworking at an 18th-19th century village in the Gamo district. In addition, the authors provide the first direct evidence for the introduction of Zebu cattle (*Bos indicus*) into the region.

Mitchell (2018) contributes an important review of the many questions and existing evidence surrounding the issue of zoonotic diseases and their effects on the husbandry and translocation of domesticates across the continent. Expanding on previous reviews focused on livestock, cattle (*Bos* sp.), sheep (*Ovis aries*) and goats (*Capra hircus*), Mitchell looks more comprehensively at African domesticates, including dogs (*Canis familiaris*), horses (*Equus caballus*) and donkeys (*Equus asinus*). The paper highlights not only the constraining role of zoonotic diseases, but also the ingenuity and persistence of African communities, as they devised strategies to increase the suitability of Afrotropical environments for their animals.

Finally, two articles in this section (Yeshurun, 2018; Jones et al., 2018) contribute to the growing body of archaeozoological literature on the interpretive potential of 'old' museum collections despite sampling and contextual issues (see also Price and Arbuckle, 2013; Jones and Gabe, 2015; Conrad et al., 2016; Grody, 2016).

3. Multi-analytical approaches to African archaeozoology

Archaeologists increasingly incorporate new techniques, as well as use established techniques in 'new' ways, to analyze and interpret faunal remains and to complement traditional approaches to archaeozoological analysis. The integration of, for example, ancient DNA (aDNA) and isotope geochemistry, is becoming commonplace amongst archaeozoologists working outside of Africa (see Horsburg, 2015; Makarewicz and Sealy, 2015; Makarewicz, 2016), yet these newer techniques remain under-utilized in African archaeology. The five articles in this section provide an excellent opportunity to illustrate the interpretative possibilities brought about through the integration of multi-analytical approaches to understanding human-animal relationships on the continent. Furthermore, the application of innovative techniques in African contexts offers new possibilities for these techniques to be applied elsewhere. What follows is a summary of the new analytical techniques featured in this volume and their relevance to African and world archaeology. Most of the contributions to this section demonstrate the utility of integrating new analytical approaches with more traditional techniques of archaeozoological analysis.

Molecular techniques such as aDNA and ZooMS have great potential to expand and refine taxonomic identifications of faunal remains, especially where traditional morphological analysis is hampered by poor preservation – a common occurrence in Afrotropical contexts – and a lack of diagnostic features to distinguish closely allied taxa (Buckley et al., 2009; Buckley et al., 2010; Murray et al., 2013; Grealy et al., 2015; Coutu et al., 2016; Prendergast et al. 2017). But, these newer techniques carry their own challenges (e.g. Scott and Plug, 2016). aDNA analysis of animal bones, for example, has rarely been attempted in tropical and sub-tropical contexts, due to issues of DNA preservation (Murray et al., 2012). Moreover, the strength of both aDNA and ZooMS depends on the availability of reference databases.

Building on the first successful application of aDNA bulk-bone metabarcoding to a sub-tropical archaeological context (Grealy et al., 2015; Grealy et al., 2016), Douglass et al. (2018) significantly expand the known list of fish taxa exploited by coastal communities in Late Holocene southwest Madagascar. By combining traditional morphological and taphonomic study with aDNA bulk-bone metabarcoding and comparison with modern fisheries data, these authors demonstrate the importance of a multi-analytical approach in generating long-term perspectives on a critically endangered Madagascar fishery. As is the case with ZooMS, aDNA bulk-bone metabarcoding is a relatively affordable and therefore widely accessible technique that could be used to systematically complement traditional morphological approaches.

aDNA is also showcased in this volume by Pires et al. (2018) in their paper highlighting trade and interaction in Roman Iberia and North Africa through the lens of dog breeding and translocation. The authors integrate osteological, morphological and palaeogenetic data to describe the phenotypic and genetic diversity of dogs in the Roman period. Through their multi-analytical approach, Pires et al. build on previous work to understand the close interactions between dogs and people, and the intensive management and husbandry of dogs during the Roman period (e.g. Colominas, 2015; Bennett et al., 2016a; 2016b).

Two contributions to this volume tackle important questions relating to management and use of herding animals in North Africa (Dunne et al., 2018) and the Sahel (Chipps Stone, 2018) using molecular techniques. Dunne et al. investigate the development of dairying in North Africa through lipid and isotopic analysis of organic residues in ceramics. By combining residue analysis with interpretation of mortality profiles among cattle, sheep and goat remains, the authors conclude that cattle were especially valued for their dairy products and that meat from domestic stock may have represented a less substantial contribution to local lifeways. These North African data affirm that the importance of dairying to the inception and spread of herd management cannot be underestimated (see McClure, 2015).

Chipps Stone investigated herding practices in the context of Mali's Inland Niger Delta. She tackles the question of subsistence specialization in the urban centers of Jenné-jeno and Djenné, a topic that has been a primary focus of research in the region (MacDonald, 1995; McIntosh, 2005). Here Chipps Stone marshals osteometric and isotopic data from cattle assemblages to test whether cattle were maintained by specialist transhumant herders or were kept by generalists with a low degree of mobility. The data presented do not support the model of specialized herders at Jenné-jeno, the earlier urban center, but do support this scenario at more recent Djenné. The innovative use of a multi-analytical approach to cattle remains at these sites allows for a re-evaluation of socio-political and socio-ecological models of West African urbanism.

Finally, the spatial attributes of faunal remains receive careful consideration in a contribution by Cruz-Folch and Valenzuela-Lamas (2018), where the authors analyze funerary and urban waste contexts in first millennium BC Algeria, Tunisia and Morocco. In particular the authors integrate data on the location, local environment, type of inhumation and structure of funerary monuments, with archaeozoological data from urban waste deposits into a GIS, in order to draw attention to the diversity of cultural preferences and practices in this region during the Roman period. The authors demonstrate the utility of incorporating data germane to understanding cultural preferences, in this case different funerary practices and the relative rates of consumption of meat of different herd animals, into a spatial analytical framework.

4. African fishers

Because of the important role of fish and fishing through time and space, affecting multiple aspects of human life in the past, and the tight relationship between fishing and the natural environment, 'fishing' is a subject well-suited for interdisciplinary studies. This was also the premise of the SAfA conference's *African Fishers* session. The five contributions in this volume broadly address three themes: the insufficient consideration of the importance of fish in ancient diets, human–(aquatic) environment interaction and the intensification of fishing and technological developments.

The collection, recording and reporting of fish remains found in excavations conducted in the 1960s at Palaeolithic sites in the Egyptian Nile Valley were incomplete, making it impossible to evaluate their role at that time and place (Yeshurun, 2018). However, the importance of fishing is attested elsewhere in the Pleistocene Nile Valley (Vermeersch and Van Neer, 2015; Dufour et al. 2018). Although views have now changed significantly, the work of Sutton (1974, 1977) remains a bench mark for emphasizing the role of fish in large parts of Africa during the Early and Middle Holocene, when food production emerges on the continent. Over 40 years ago, Sutton pointed out that archaeologists' obsession with early food production, obscured much of the complexity of lifeways and survival strategies during the Holocene, particularly the continued importance of wild resources. Nevertheless, the origins and spread of domesticated food resources continue to receive the most attention, and it remains necessary to highlight the contribution of fish. In this volume Linseele and Zerboni (2018) and particularly Coudert et al. (2018) demonstrate the continued importance of fish after the introduction of domesticated animals (see Jousse et al., 2008; Whitelaw, 2009 for examples from elsewhere in Africa).

It is clear that fishing in Africa is tied to water basins and wetland areas (Mitchell, 2013). Did people rely on fish because they lived in aquatic environments, or did they deliberately look for such habitats to exploit fish and other aquatic resources? At least at some sites the data suggest the latter, with people actively looking for specific spots where fishing was particularly easy and productive (Prendergast and Beyin, 2018). Such favorable locations may also have been sources of conflicts and inter-group violence (Lahr et al., 2016). Similar spots seem to have served as places for (seasonal) gathering and perhaps feasting and/or rituals. This possibility is supported, for example, by the appearance of fish traps in Egyptian rock art dated to the first half of the Holocene (Huyge, 2005). Favorable places where fishing was comparatively easy and productive appear to be marshes and seasonally flooded areas, where spawning and migrating fish constituted easy prey (Van Neer, 2004; Linseele and Zerboni, 2018; Prendergast and Beyin, 2018). Based on ethnographic parallels, people likely actively altered water basins, mainly through damming, to improve fishing productivity, which could in some cases be called proto-domestication (Dounias et al., 2016).

Aquatic environments were not stable over time due to climatic changes and this lead to changing fishing opportunities. Through stable isotope analysis of tilapia (*Oreochromis niloticus*) otoliths Dufour et al. (2018) were for example able to confirm a new model of Late Pleistocene Nile behavior as well as to reconstruct the fishing strategies of humans living in this environment. The first part of the African Holocene is characterized by a wet climate phase, the so-called African Humid Period (AHP) (deMenocal et al., 2000; Tierney and deMenocal, 2013), causing the swelling of many rivers and lakes. It is no coincidence that several papers in this volume deal with the AHP (Coudert et al. 2018; Linseele and Zerboni, 2018; Prendergast and Beyin, 2018, Smith, 2018), which created favorable circumstances for fishing in large parts of Africa. After the AHP, fishing economies persisted in areas where wetlands and marshes also persisted. The difficulty lies in distinguishing between changes in subsistence strategies induced by the changing climate and the consequences of the appearance of food production, the spread of which is in turn linked to climatic fluctuations (e.g., Lesur et al., 2013). Jousse (2006) showed that in parts of West Africa food production replaced fishing as a reaction to climate aridification. One of the important parameters determining human-induced regional climate change, is pressure on land cover, which is apparently reduced where reliance on fishing is higher (Kay and Kaplan, 2015).

Aquatic environments were not only rich in fish, but also in other aquatic animals, such as turtles. Moreover, especially in arid parts of Africa, water basins were also richer in wild game and plants than surrounding areas. Despite the many positive aspects of water basins, the negative aspects, particularly potential disease risks, should not be forgotten (Gifford-Gonzalez, 2000; Mitchell, 2018). Both humans and their livestock were exposed to disease risks and the relationship between humans and their environment must have changed once they had domesticated livestock. However, the appearance of domesticated species in Sudan had no clear effect on the composition of the faunal remains and the percentage of fish (Linseele and Zerboni, 2018).

The presence of ceramics at AHP fishing sites predating the appearance of food production, suggests that these pots may have been used for the preparation of fish (Haaland, 1992). However, residue analyses on ceramics from prehistoric African contexts does not currently support this interpretation (see Dunne et al., 2018). There are indications that at early dates people were treating (large numbers of) fish for later consumption through smoking (Egyptian Nile Valley, ca. 13000-12000 cal BC; Van Neer et al., 2000) and salting (Sudan, 7th millennium cal BC; Maritan et al, 2018). At other sites, including Asa Koma (Djibouti, 3rd millennium cal BC), the mere quantities of fish suggest they were treated in some way (Coudert et al., 2018). Depending on the taxa and environment in which they can be caught, fishing requires technological skills and advanced technology. For the Egyptian Nile Valley more open water species start to appear after the Palaeolithic, which indicates the use of boats (Van Neer, 2004). As far as fishing equipment and technology is concerned ethnographic sources continue to be useful for archaeological research (e.g., Smith, 2018; Dounias et al., 2016).

5. Conclusion

The articles brought together in this special volume highlight the diverse spatio-temporal and methodological nature of African archaeozoology. Our goal has been to showcase a range of archaeozoological research projects on the continent, and demonstrate what can be accomplished through the integration of different methods and analytical frameworks. We hope this volume will be useful to a broad readership, not limited to faunal specialists. As demonstrated by a number of contributions to the volume, faunal remains have the potential to reframe our thinking about major anthropological questions on the African continent and its offshore islands, including the emergence of food production, urbanism, networks of trade and exchange, colonial entanglements and more.

Nevertheless, the relatively small number of archaeozoologists working on African assemblages (compared to other world regions) remains a drawback to advancing the field. Linked to this is the shortage of highly detailed specialist analyses of specific taxonomic groups, such as micro-mammals, birds, fish and shells. Access to adequate comparative skeletal collections also continues to hinder the level and accuracy of taxonomic identifications. Yet Africanist archaeozoologists are taking on these challenges through innovative and integrative analytical and interpretive approaches to their research. We believe that this volume will present those working beyond the African continent with comparative examples that will complement and enhance the global understanding of human-animal interactions.

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